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7.1 ALTERNATIVES CONSIDERED

IID used the following evaluation criteria as a means of evaluating and ranking alternatives:

- **Economic feasibility** – the selected alternative must be economically feasible such that the economic value of the Project, inclusive of the proposed alterative, offers IID customers economic value in comparison with alternative market solutions for generation resources.
- **Commercial availability/feasibility** – the selected alternative must use commercially demonstrated technologies and proven as an accepted industry standard; it must be operational within a reasonable timeframe while considering the required permits and approvals.
- **Maximize thermal conversion efficiency** – The selected alternative must convert fuel resources to electrical energy at a low cost and high thermal efficiency given the specified capacity requirement for IID load serving capability.
- **Maximize use of existing assets** – The selective alternatives must use existing assets (facilities, operating, and administrative staff, etc.) to their fullest potential.

As part of the Project development process, IID considered a number of Project alternatives. The alternatives selection process is discussed in more detail below, and included the following:

- No Project Alternative (Section 7.2)
- Site Alternatives and Linear Facilities (Section 7.3)
- Alternative Generating Technologies (Section 7.4)
- Water supply and Wastewater Discharge Alternatives (Section 7.5)
- Alternative Interconnection Options (Section 7.6)
- Alternative Emission Controls (Section 7.7)

7.2 NO PROJECT ALTERNATIVE

Unlike a greenfield development project, the Unit 3 Repower Project represents significant environmental benefit compared with the No Project Alternative. The No Project Alternative represents continued operation of the existing ECGS Unit 3 STG with the existing permit limits for emission factors, existing water use and the requirement for increased operating hours of the ECGS Unit 3 as IID loads grow.

The Project design described in Section 2, Project Description, represents a Project that offers significant environmental and energy efficiency benefits over the No Project Alternative by increasing fuel efficiency 90%, increasing water use efficiency 60%, and resulting with Unit 3 complying with current BACT standards and providing emission offsets. These environmental benefits are eliminated in the No Project Alternative.

The proposed Project design and related capital and operating costs as well as the associated environmental benefits were balanced such that the Project could offer an economic advantage to IID customers over alternative greenfield projects and power purchase agreements offered IID Supply and Trading RFP #484.

While increased environmental benefits associated with alternative design concepts (discussed below) may be available, these alternatives add significant cost and would render the Project economically infeasible thus denying any environmental or energy efficiency benefit. While the Applicant has considered alternatives and the associated benefits, the economic value was the basis of the award under RFP #484 and the foundational assumption to assure that competitive projects are advanced to serve IID customers.

The IID service territory is currently growing at a rate of 7% per year. Under the No Project Alternative, IID would continue to purchase intermediate and base load power from the open market or continue to use older less efficient intermediate and base load generation facilities with higher heat rates (as compared to the Unit 3 Repower Project). The continued increase in imported power to meet local demand is of concern to IID energy management; in fact, a target has been set by IID management to keep imported power to 50% or less of IID's annual energy needs. IID currently generates 30% of its annual energy needs. Therefore, the No Project Alternative does not meet the reliability-based business objectives to promote the development of internal generation resources to meet the current and growing customer load and provide ancillary services to the electrical system as well as denying the environmental and energy efficiency benefits. In addition, growing imports without the addition of internal generation stresses the high voltage transmission system and eliminates the ancillary service benefits (i.e., voltage support, regulation, etc.) associated with internal generation.

Another key factor to consider is that IID must comply with Assembly Bill (AB) 380 which requires installed capacity to meet reserve requirements. AB 380 was approved by the Governor of California on September 29, 2005. Section 2 of this bill adds Section 9620 to the Public Utilities Code which requires that each local publicly owned electric utility servicing end-use customers prudently plan for an procure resources that are adequate to meet its planning reserve margin, peak demand, and operating reserves, sufficient to provide reliable electric service to its customers.

AB 380 will require IID to maintain physical generating capacity adequate to meet its local requirements. IID and others have been relying on firm energy transactions covered by Schedule C of the Western System Power Pool Agreement to meet part of its peak load requirements. This is changing not only for IID but for other Load Serving Entities in California.

In conclusion, the Project will (1) add 84 MW of capacity to IID's physical generation portfolio, (2) provide environmental benefits and increased energy efficiency, and (3) help IID meet its new requirements under AB 380.

7.3 SITE ALTERNATIVES AND LINEAR FACILITIES

As discussed in the sections below, the Project was driven by the needs identified by IID Supply and Trading, which is responsible for 10-year resource planning and the procurement of sufficient energy resources for IID's customers.

To obtain the required power supplies, IID Supply and Trading issued an RFP seeking qualified projects or market products to serve IID intermediate and base loads (RFP #484). Although bids were received from outside organizations, they either (1) did not meet the established credit criteria in RFP #484, or (2) the projects offered were located outside of the IID service territory

and exacerbated transmission import constraints, or (3) did not compete favorably with the proposed Project on an economic basis**.**

In response to this RFP, IID Generation identified repowering Unit 3 for a natural gas-fired combined cycle project in response to the RFP for up to 150-MW of base load capacity and energy.

The Unit 3 Repower alternative was selected based on the existing natural gas transportation, electric transmission, and water supply infrastructure that could support up to 100 MW of intermediate and base load generation additions without infrastructure improvements and new linear facilities. The absence of new linear facilities such as new transmission lines or natural gas pipelines outside of the property boundary limited the potential of any environmental impacts associated with the Project to within the ECGS Site.

The Project Site is located on property owned by IID and therefore site control was not of concern. In addition, from an electrical interconnection perspective, the ECGS Site offered benefits to the IID transmission system and access to the primary load centers in the IID service territory.

IID Generation proposed several natural gas turbine technology alternatives on the ECGS Site. Based on the pricing structure and the site characteristics, IID Supply and Trading awarded the Unit 3 Repower Project to IID Generation. Key selection drivers were the economic value offered, the existing asset base that could be utilized on the ECGS Site, and interconnection infrastructure for gas, water and electric present at the ECGS Site.

7.4 ALTERNATIVE GENERATING TECHNOLOGIES AND DESIGN CONSIDERATIONS

7.4.1 Generation Alternatives

Generation technologies such as coal, biomass, and oil were considered but these fuels would not provide the same environmental benefits of natural gas. These alternative fuel sources would also require additional linear facilities and therefore potential environmental impacts not associated with the chosen technology. Alternative technologies such as solar, wind, fuel cells, or water-based technologies were considered, however, IID maintains a separate RFP process for the acquisition of renewable power. In fact, IID has voluntarily committed to the establishment of a Renewable Portfolio Standard (RPS) of 20 percent, consistent with state-level RPS applicable to investor-owned utilities, as outlined in Senate Bill 1078.

Natural gas-fired simple-cycle operation of CTGs did not meet the requirements of RFP #484, to provide additional intermediate and base load power. Combined-cycle projects were therefore considered as the only technology that met the needs of IID customers.

IID considered the following combined-cycle configuration alternatives:

- One 80 MW class CTG and HRSG (repowering the existing 44 MW Unit 3 STG)
- One 170 MW class CTG and HRSG (repowering the existing 80 MW Unit 4 STG)

The Unit 3 Repower Project alternative was selected based on the economic value offered and the size of the Project given the RFP request of 100 MW to 150 MW of base load capacity and

energy. The Unit 4 repower, with a 225-MW capacity, was deemed too large as a single contingency on the IID system and the resulting operating reserve requirements given the current peak and average load profile of the IID customers.

In April 2005, IID Supply and Trading recommended the award of the Project, and the IID Board of Directors approved the Project as part of the Load/Resource Plan for IID. In June 2005, the IID Board of Directors authorized the development of the Project.

7.4.2 Other Design Considerations

Several additional reliability and/or design alternatives were evaluated for the Project. Many of the design alternatives were rejected because of either excessive cost associated with the design alternative or concern over the proven nature of the alternative. As discussed in Section 7.1, the basis for determination of a feasible Project includes meeting the criteria of both proven technology and cost effective alternatives. Unlike a greenfield project where the No Project Alternative represents no environmental impact, these design alternatives were compared to the No Project Alternative that reflects continued operation of the ECGS Unit 3 STG with existing output, heat rate, emissions, and water use.

- A once through boiler was evaluated for quick-start capability, however a conventional horizontal flow HRSG was selected.
- A bypass stack to allow for simple cycle operation was evaluated but considered uneconomic given the cost and the limited simple cycle use of the Unit 3 Repower Project.
- Black start capability was not included given the provision of black start in the Niland Gas Turbine Plant Project.
- Dual fuel operations for the CTG were evaluated but rejected given the environmental impacts.
- Duct burners were added to the Project design to provide additional operating flexibility and capacity (MW).
- Conversion to dry cooling was eliminated due to the excessive cost, reduction in output (MW), and decreased operating efficiency (higher heat rate) as compared to continued use of the existing cooling tower. This alternative was evaluated to be less economically beneficial than the No Project Alternative (i.e. continued operation of the existing ECGS Unit 3 STG).
- Addition of a crystallizer-based zero liquid discharge system was eliminated due to excessive cost as compared to the Project's participation in the deep well injection system under development for the entire ECGS. This alternative was evaluated to be less economically beneficial than the No Project Alternative (i.e., continued operation of the existing ECGS Unit 3 STG)
- A reverse osmosis system to recycle water and minimize wastewater disposal quantities was eliminated as a technology option given the increase in water use efficiency offered by the Project and the excessive operating and capital cost of such reverse osmosis systems. This alternative was evaluated to be less economically beneficial than the No Project Alternative (i.e., continued operation of the existing ECGS Unit 3 STG).

- The wastewater discharge alternatives evaluated for the ECGS, are discussed in Section 7.5.2, Wastewater Discharge Alternatives.

7.5 WATER SUPPLY AND WASTEWATER DISCHARGE ALTERNATIVES

The Applicant considered several water supply and wastewater discharge alternatives for the Project. These alternatives are discussed in the following sections.

7.5.1 Water Supply Alternatives

The existing ECGS Unit 3 uses raw water from the Dogwood Canal for power plant cooling and make-up water for the existing ECGS water treatment system. Based on the annual water requirements of approximately 1,029 acre-feet per year, which is less than 0.1% of the amount of water delivered by IID to its customers in the Imperial Valley, the use of raw, imported water from the Dogwood Canal is preferred as the primary water supply option for the Project. Selection of this source is based on the following:

- The Dogwood Canal is located adjacent to the ECGS Site. Therefore no off-site linears are required and there are no new interconnections required.
- The Dogwood Canal has been the source of industrial water supply for ECGS since inception in 1949.
- The water supply and quality meets the requirements for the Project.
- A more than adequate water supply from IID and robust storage capacity is available at the Project Site.

Other potential sources of water, as listed in SWRCB Resolution 75-58, were considered but deemed to be infeasible as summarized below. Several alternative water sources were evaluated as part of the Unit 3 Repower Project, including:

- Brackish water from groundwater or irrigation return flow
- Municipal wastewater from the El Centro WWTP
- Other inland water sources

Alternative 1: Ocean Water

Ocean water is not considered a feasible alternative since this water source is not locally available.

Alternative 2: Brackish Water from Groundwater or Irrigation Return Flow

Irrigation return flows and discharges from WWTPs in Imperial County and along the border of Mexico are directed to and serve as the primary source of replenishment water to the Salton Sea. A balance between inflowing water and evaporation sustains the Salton Sea. The California Department of Water Resources (DWR) is working with the CDFG to develop the Salton Sea Ecosystem Restoration Plan, a preferred alternative for the restoration of the Salton Sea ecosystem and the protection of wildlife dependent on the ecosystem (see http://www.saltonsea.water.ca.gov/). Although the Ecosystem Restoration Plan is not scheduled

for completion until December 31, 2006, it is anticipated that diversions of these brackish water sources, including brackish groundwater sources that augment irrigation return flows, would be contrary to the objectives of the plan. In addition, irrigation return flow is considered infeasible due to the cost of infrastructure development to deliver the water to the Project Site and the cost of water treatment and disposal.

Brackish groundwater under the ECGS Site has elevated TDS levels, which make this source of water infeasible from an economic and energy efficiency perspective. TDS values are estimated to be on the order of approximately 14,000 mg/L, which would require significant water quality treatment prior to use. Capital costs to develop a groundwater well collection and delivery system, treatment facilities, including sand filters, RO, chemical additives, and potentially a clarifier, would make the cumulative capital costs excessive for this water alternative uneconomic.

In addition to the poor quality of the groundwater, the quantity of developable groundwater supply in the area is limited. The shallow aquifers in the vicinity of the Project have very low transmissivities and therefore would not be able to provide the quantity of water needed by the Project.

Thus, this alternative was not chosen because it was considered environmentally undesirable and economically unsound.

Alternative 3: Municipal Wastewater

The El Centro WWTP located at 2255 North La Brucherie Road, is approximately 3.24 miles from the Project Site. This WWTP was designed to have a treatment capacity of 8 million gallons per day (mgd), and currently operates at a discharge of 3.6 mgd. The use of wastewater effluent from this facility by the Project was considered infeasible for the following reasons:

- The WWTP does not treat wastewater for industrial reuse nor does it distribute water for this purpose.
- Use of wastewater from the WWTP would require the Applicant to treat the incoming wastewater to cooling tower standards at additional costs which is infeasible.
- As with agricultural drainage flows discussed above, WWTP discharges are needed to maintain the level of the Salton Sea. Therefore, it is anticipated that diversions of these discharges for Project use would be contrary to the objectives of the Salton Sea Ecosystem Restoration Plan.

Therefore, this inland wastewater alternative is considered to be environmentally undesirable and economically infeasible due to (1) impacts on Salton Sea, and (2) increased infrastructure development in the form of linears and pump stations.

Alternative 4: Other Inland Waters

The following inland water supply sources were considered for the Project:

- Groundwater at or near the Project Site. Groundwater was rejected as a potential source due to poor quality and limited quantity identified in Alternative 2.
- Potable water from the City of El Centro. Potable water from the City of El Centro was not considered for industrial use at ECGS, so that it can be used for drinking water and other

domestic uses. Potable water sources from the City of El Centro are derived from IID's water distribution system, which is from the Colorado River. Given an identical water source (Colorado River), utilization of the existing water treatment facility at the existing ECGS is optimal.

- Surface water from the Alamo River, New River and Imperial Valley Drains. Water from these sources has poor water quality and would not be suitable for use without substantial treatment. All are listed on the RWQCB's list of impaired waters as being impacted by agricultural return flows. Both the Alamo River and New River are also impacted by pollutants introduced from Mexico (RWQCB, 2004b).

No other inland waters exist; therefore inland water alternatives are considered environmentally and economically unfeasible.

7.5.2 Wastewater Discharge Alternatives

In this balancing of resource needs and environmental impacts, water use was the factor that was closely evaluated as various technology options for waste stream management were considered.

Two primary alternatives were evaluated to manage wastewater including treatment to meet discharge limitation or discharge elimination. This evaluation process was conducted not as part of this Project, but as part of a separate and parallel project to meet the requirements set forth in the ECGS NPDES permit. While this is a parallel project and associated study, it is relevant to this discussion because the existing NPDES permit covers the wastewater generated to operate the existing Unit 3 STG, therefore, any modification to the ECGS facility will use the new wastewater discharge system. The two alternatives were:

- Treat the current ECGS facility wastewater discharge to meet the CTR
- Eliminate the discharge altogether

Treatment was dismissed as a viable alternative due to the increasingly stringent future discharge limitations or the potential for requiring discharge elimination. Therefore, IID studied three options for eliminating the wastewater discharge from the ECGS facility including (1) using mechanical evaporation, (2) using solar ponds for evaporation, or (3) using deep well injection for disposal.

The mechanical evaporator option was dismissed because of the high operations and maintenance cost associated with the systems operation (e.g., parasitic load on ECGS, disposal of waste generated, etc.). Evaporation ponds were determined to be too costly in terms of both installation costs and land requirements. In addition, if the ECGS facility were further expanded in the future, the evaporation ponds would not be easily expanded to meet the additional wastewater flows. The deep well injection system was the least expensive to install and operate, and could also more easily be expanded. Deep well injection is a common accepted practice in the Imperial Valley, due to the amount of geothermal power plants in the valley.

Given the significant cost differential and regulatory certainty, the deep well injection system was determined to be the best option for the ECGS facility.

More information on water supply and wastewater discharge alternative options is presented in Section 6.13, Water Resources, of this SPPE Application.

7.6 ALTERNATIVE INTERCONNECTION OPTIONS

No alternative electrical transmission alternatives were evaluated as part of this Project, since an existing El Centro Switching Station with sufficient capacity already exists within the ECGS Site. Connecting to another IID El Centro Switching Station was viewed as infeasible and would result in unnecessary potential environmental impacts.

The Project will interconnect to the existing SCGC high pressure gas metering station on the existing ECGS Site. SCGC provides natural gas transportation service to the ECGS via two pipelines (10 and 12 inches) running south from the SCGS Niland Regulation Station to ECGS. An alternative natural gas transportation source has been considered for the Project. As part of the 10-year planning process performed by IID Supply and Trading, IID executed a Precedent Agreement with North Baja, LLC (a subsidiary of TransCanada) in October 2005, which will, if fully implemented, provide an additional 110,000 MMBtu per day of natural gas transportation capacity for gas supplies to Imperial Valley. This agreement advances terms and conditions under which North Baja LLC would permit, construct, and operate a 46-mile natural gas lateral from the North Baja pipeline that currently transports natural gas from Ehrenberg, Arizona (through an interconnection with El Paso Natural Gas Pipeline), to the Mexican border (interconnection with Baja Norte pipeline), passing through Imperial County. The termination point for the 46-mile lateral will be within the ECGS Site. The 46-mile lateral is being permitted through a separate permitting process led by FERC and the California State Lands Commission. As such, any environmental impacts associated with this pipeline are being analyzed as part of the FERC permitting process.

The North Baja gas transportation capacity could become the primary gas transportation supply for ECGS including the Unit 3 Repower Project if: (1) the lateral project is successfully permitted and constructed, and (2) all conditions precedent under the Precedent Agreement are achieved or waived; and IID Supply and Trading takes service under the Firm Transportation Service Agreement with North Baja, LLC.

7.7 ALTERNATIVE EMISSION CONTROLS

IID's objective in selecting equipment and vendors is to ensure continuous compliance with air quality regulations and ongoing operating efficiency through a history of demonstrated performance in similar installations.

One emissions control strategy has been repeatedly used and demonstrated to meet BACT requirements for combined-cycle natural gas turbines. This strategy includes the use of SCR to reduce NO_x emissions, combined with a CO oxidation catalyst to reduce CO emissions. The SCR/CO oxidization strategy has been utilized in numerous natural gas turbine projects and has been demonstrated to be safe, reliable, and cost-effective through significant accumulated hours of operation. SCR/CO oxidization is understandably recognized by natural gas turbine manufacturers and by environmental regulators as the standard for BACT determinations.

There exists one known emerging technology as an alternative emission control strategy referred to as SCONOx™, but SCONOx™ has not been proven for projects of this nature or size and therefore does not satisfy the IID evaluation criteria presented in Section 7.1. However, a discussion of the SCONOx™ technology is presented in Appendix B, Air Quality, Attachment E, BACT Assessment.